DIVISION OF RESEARCH AND INNOVATION

I-TEAM BRIEF

The Innovation Team (I-Team) at the Caltrans Division of Research and Innovation, in cooperation with its partners, develops proven, ready-to-deploy innovations in methods, materials, and technologies that enable Caltrans to provide the most effective management of public services, resources, and infrastructure.

SEPTEMBER 2010

Updated: October 2010

ShakeCast

A post-earthquake decision-making and rapid-response tool

After a major earthquake, one of Caltrans' most critical tasks is to assess the impact on the condition of all bridges and roadway corridors in the state highway system. Timely response ensures public safety, guides emergency vehicle traffic, and reestablishes critical lifeline routes. Without sufficient data, initial reconnaissance takes up precious time. ***The Caltrans I-Team adopted ShakeCast, a tool that uses data from an earthquake event to support rapid post-earthquake response.***

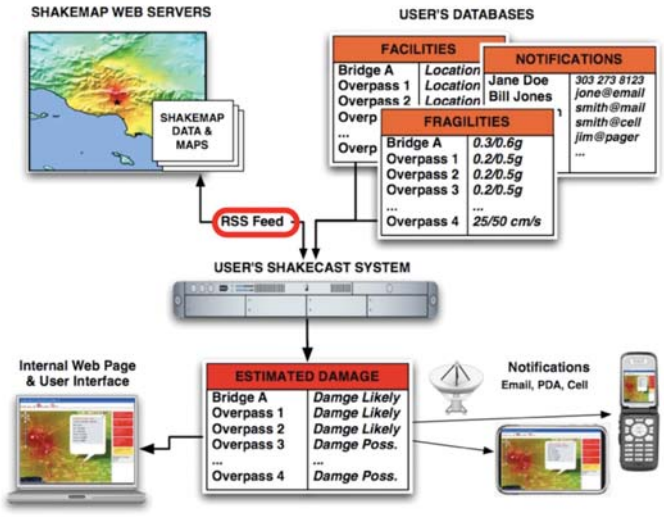
READY TO DEPLOY

ShakeCast is a Web-based application that automatically retrieves measured earthquake shaking data and analyzes the data in relation to individual bridge performance characteristics. By focusing inspection efforts on the most damage-susceptible infrastructure in the most severely shaken areas, ShakeCast has drastically reduced Caltrans' response time to assess potentially damaged structures after an earthquake.

NEW AND IMPROVED

- Retrieves measured shaking data within minutes after an earthquake.
- Compares shaking distribution with unique bridge vulnerabilities.
- Provides hierarchical lists and maps of bridges most likely impacted.
- Emails bridge and facility location and inspection priority information to responders within 15 minutes following events with a magnitude greater than 4.0.
- Automatically generates products for direct use in Google Earth®, ArcGIS®, and Excel®.
- Provides a suite of tools on ShakeCast website.

ShakeMap/ShakeCast Flowchart



About ShakeCast

In 2005, Caltrans initiated a research contract with the United States Geological Survey (USGS) to develop and implement a Caltrans-specific version of Shake-Cast, a post-event software analysis tool. The goal was to change the way that Caltrans responds to major earthquakes. ShakeCast was built on ShakeMap, a USGS product that receives measured ground motion data from a network of more than 1,900 sensors throughout California—approximately two-thirds of all sensors nationwide—and combines the information with geological data to create maps that show ground-shaking intensity.

GET STARTED

To receive data from ShakeCast, just ask to be added to the email response list.

Contact:
Loren Turner, Caltrans DRI
Loren.Turner@dot.ca.gov, 916.227.7174

Learn More

USGS ShakeCast website:
http://earthquake.usgs.gov/research/software/shakecast/

ShakeCast guided tour:
http://tinyurl.com/shakecast-tour

Transportation Research Board (TRB) article: "Research Pays Off—ShakeCast: Caltrans Deploys a Tool for Rapid Postearthquake Response"
http://tinyurl.com/trb-shakecast

TRB Research Report (link to CD Rom): "ShakeCast: Facilitating the Use of ShakeMap for Post-Earthquake Decision-Making and Response Within Caltrans and Other Critical Lifeline Communities"http://pubsindex.trb.org/view.aspx?id=839740

Caltrans I-TEAM BRIEF

SUCCESSES

- ShakeCast was deployed in June 2008 and is now an integral component of Caltrans' response protocol.
- The system is currently used by Caltrans Maintenance and other emergency earthquake-response service providers.
- ShakeCast has more than 300 subscribers, including traffic management centers, Geotechnical Services office chiefs, earthquake engineers, Los Angeles County schools, Walmart, and Caltrans middle and upper management and post-earthquake investigation teams.

METRICS

In the magnitude 5.4 earthquake near Chino Hills in July 2008, only one bridge sustained significant damage. The initial Caltrans ShakeCast notification identified this bridge in the top 10% of inspection priorities out of the more than 300 bridges assessed. The follow-up notification message, which took into account more comprehensive ground-motion data, listed the bridge as the third highest inspection priority after assessing more than 400 bridges.

The Golden Guardian earthquake preparedness exercise in November 2008 deployed ShakeCast to generate assignments for Caltrans bridge inspections. The exercise scenario hypothesized a magnitude 7.8 earthquake on Southern California's San Andreas Fault to test the coordination efforts of regional responders. The exercise gave Caltrans responders valuable insight into the potential impacts a severe event would have on the highway infrastructure because of bridge damage.

GET READY

- ShakeCast operates on Caltrans and USGS servers 24 hours a day, 7 days a week, and relies on a robust system of Caltrans e-mail servers to distribute the notification messages.
- Phase II has been funded and will be carried out over the next three years. Phase II includes significant feature improvement and long-term maintenance resources requirements.

The Post-Earthquake Investigation Team Report on the Chino Hills earthquake shows damage to Pier 4.